

Additional Properties of Binomial Distribution

Example: p. 234/4 *Insurance: Auto*

The Mountain States Office of State Farm Insurance Company reports approximately 85% of all automobile damage liability claims were made by people under 25 years of age. A random sample of five automobile insurance liability claims is under study.

(a) Make a histogram showing the probabilities that $r = 0$ to 5 claims are made by people under 25 years of age.

(b) Find the mean and the standard deviation of this probability distribution.

For samples of size 5, what is the expected number of claims made by people under 25 years of age?

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Let's identify n (number of trials), p – probability of success, and q – probability of failure.

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$$n=5$$

$$p=0.85$$

$$q=1-0.85=0.15$$

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$$p=0.85$$

$$q=0.15$$

(a) Make a histogram showing the probabilities that $r = 0$ to 5 claims are made by people under 25 years of age.

$$P(0) = (n=5 \ r=0 \ p=0.85 \ \text{Table 2}) = .000$$

$$P(1) = (n=5 \ r=1 \ p=0.85 \ \text{Table 2}) = .002$$

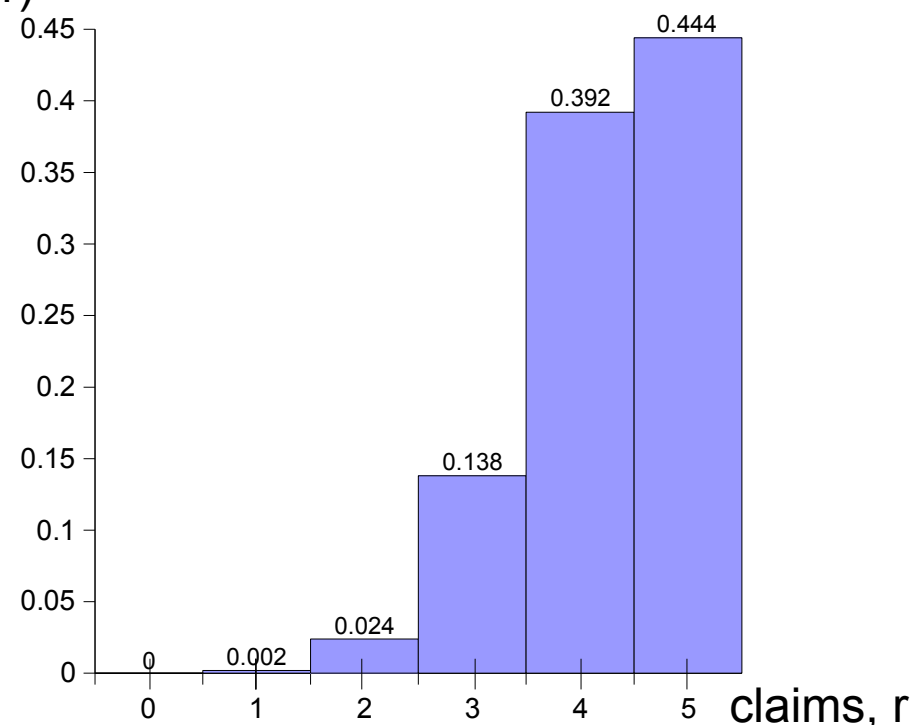
$$P(2) = (n=5 \ r=2 \ p=0.85 \ \text{Table 2}) = .024$$

$$P(3) = (n=5 \ r=3 \ p=0.85 \ \text{Table 2}) = .138$$

$$P(4) = (n=5 \ r=4 \ p=0.85 \ \text{Table 2}) = .392$$

$$P(5) = (n=5 \ r=5 \ p=0.85 \ \text{Table 2}) = .444$$

$P(r)$ **Probability Distribution of Claims**



Just a check: $\sum P(x) = P(0) + P(1) + P(2) + P(3) + P(4) + P(5) = 1$

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$$n=5 \quad p=0.85 \quad q=0.15$$

(b) Find the mean and the standard deviation of this probability distribution.

For samples of size 5, what is the expected number of claims made by people under 25 years of age?

$$\mu = np = 5 * 0.85 = 4.25$$

– *the expected number of claims made by people under 25 years of age (for samples of size 5)*

$$\sigma = \sqrt{npq} = \sqrt{5 * 0.85 * 0.15} \approx 0.798$$

– *measure of spread*